

## THE LIFE CYCLE OF *CHARAXES MARIEPS* (NYMPHALIDAE)

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**ABSTRACT.** The life cycle, oviposition preferences and larval foodplant preferences of *Charaxes marieps* Van Someren (Nymphalidae) are reported and discussed for the first time. Females were induced to oviposit on five species of plants belonging to the family Ochnaceae viz., *Ochna arborea*, *O. arborea* var. *oconnori*, *O. holstii*, *O. serrulata* and *O. natalitia*. The life cycle was studied using only *O. serrulata*, since larvae on the other four species of *Ochna* were discarded after completion of the second instar. The egg, larva and pupa of *C. marieps* as well as larval foodplant preferences were found to be very similar to those described for *C. karkloof karkloof* indicating that they are closely related species, even though they are geographically separated by some 300 km.

The life cycles of many South African *Charaxes* are well known (Dickson & Kroon, 1978). The general aspects of the life histories of some of these have been discussed by Henning (1977). However, the life history of *Charaxes marieps* (Van Someren & Jackson, 1957) has not been thoroughly investigated. This species is endemic to the Republic of South Africa, where it is confined to the montane forests of the eastern Transvaal. It belongs to a group of closely related species referred to as the "black" *Charaxes* complex, in which the males of the various species have the uppersides of the wings almost uniformly velvety-black (Dickson & Kroon, 1978). Other members of this complex occurring in South Africa include *Charaxes phaeus* (Hewitson), *C. vansoni* (Van Someren), *C. ethalion ethalion* (Boisduval), *C. pondoensis* (Van Someren), *C. karkloof karkloof* (Van Someren & Jackson) and *C. karkloof capensis* (Van Someren). The first two species are inhabitants of the arid Bushveld, to which their foodplants are restricted (Acocks, 1975). *C. ethalion ethalion* occurs in the coastal forests of Natal and Zululand, as well as in the montane forests of the Zoutpansberg in the northern Transvaal. The life cycle of this species has been recorded by Clark (unpublished data). *C. pondoensis* is found only in the coastal forests of the Transkei and its life cycle is unknown. *C. karkloof karkloof* inhabits the montane forests of central Natal, extending southward to the coastal forests of the Transkei. The only recorded foodplant for this species is *Ochna arborea* (Burch ex DC). The early stages of this species have been described by Van Someren (1966). *C. karkloof capensis* occurs in the coastal forests of the southern Cape Province, but nothing is known of its life cycle.

Although the natural habitat of *C. marieps* is vegetationally and climatically similar to the montane forests of Natal, where *C. k. karkloof* occurs, and to the Zoutpansberg forests where *C. e. ethalion* flies,

neither of these species have been recorded flying together with *C. marieps*. Morphologically, the imagines of *C. e. ethalion* are quite distinct from *C. marieps*, but *C. k. karkloof* closely resembles the latter. Because of these similarities between *C. k. karkloof* and *C. marieps*, as well as their habitat preferences and the fact that *C. k. karkloof* is known to utilize *Ochna arborea* as a foodplant, various *Ochna* species were used in our breeding trials with *C. marieps*.

The larval foodplant preferences and life cycle of *C. marieps* have not been recorded prior to this study. The purpose of this paper is to present, for the first time, data on the life cycle, oviposition preferences and foodplant acceptability of *C. marieps*.

#### MATERIALS AND METHODS

For the breeding experiments with *C. marieps* six females were collected from the type locality at Marieps Kop, eastern Transvaal, in March 1978. Because it was suspected that *C. marieps* may utilize *Ochna* species as foodplants, the type locality was searched for the presence of *Ochna* species, as well as for eggs and larvae.

Captured females were housed separately in transparent plastic boxes and were fed once daily. Each female was offered a predetermined species of foodplant, *Ochna arborea*, *O. arborea* var. *oconnori*, *O. holstii* or *O. serrulata*. Two females were offered *O. natalitia*. Fresh leaves were provided daily and these were examined for eggs upon removal from the boxes. As eggs were found they were transferred to separate plastic containers.

Newly-hatched larvae were sleeved on the corresponding plant on which the eggs were laid and were kept at ambient temperature. Because only *O. serrulata* was available in large enough quantities to ensure completion of all the larval stages, larvae on the other four species of *Ochna* were discarded after completion of the second instar.

Larvae on *O. serrulata* were examined twice daily and their growth and coloration as well as the duration of larval, prepupal and pupal stages were noted. Daily temperature ranges during the rearing period were recorded. Some eggs and first instar larvae were collected and prepared for scanning electron microscopy by critical point drying and sputter coating with gold.

Two larvae from each instar were collected from *O. serrulata* and were killed in a 1:1 alcohol-xylene mixture. Next they were transferred to Pempel's fluid. Larvae were examined with a stereomicroscope and were drawn with the aid of a camera lucida.

## RESULTS

### Life Cycle

**Egg.** Subspherical, top and base flattened, 1.5 mm high, 2 mm diameter. About 30 longitudinal ridges made up of small tubercles, crowded at the top and disappearing towards the base (Fig. 1). Pale yellow when laid, developing a brown ring in upper third after 48 h. Larva hatches after 6–9 days and consumes entire egg shell.

**First instar.** 3–4 mm long; body creamy-yellow turning pale green after the first feeding. Headshield and anal appendages black with rusty-brown edges in some individuals. Headshield diameter 1–1.5 mm; dorsal horns 0.75–0.85 mm, curving inwards and backwards; lateral horns 0.4–0.5 mm, curving slightly upwards (Figs. 2, 3 & 8). Frons and clypeus pitted; horns bear numerous setated tubercles (Fig. 2). Body surface densely tuberculated (Fig. 3) and uniformly green. First instar lasts 8–23 days during which a length of 6–7 mm is attained.

**Second instar.** (Figs. 4 & 9). Body immaculate green; headshield and anal appendages dark brown. Dorsal horns 1.1–1.3 mm; lateral horns 0.7–0.8 mm, both dark brown with white tips. Frons and clypeus less densely pitted and horns less densely tuberculated than first instar. Body tubercles more widely spaced with white-tipped tubercles at base of anal appendages forming distinct pattern. length of 10–12 mm is attained in 20–35 days.

**Third instar.** (Figs. 5 & 10). Body light green; headshield 2.2–2.8 mm in diameter, brown with variable amount of green invading frons. Dorsal and lateral horns brown to ochre, white-tipped. Body tubercles green but a number of white-tipped tubercles scattered over body in definite pattern. Paired, white-tipped larger tubercles on either side of dorsal vessel. Towards end of instar a pair of purple dots appear dorsally on segment six. Third instar lasts 18–76 days; length attained, 14–16 mm.

**Fourth instar.** (Figs. 6 & 11). Headshield 3.5–4.2 mm in diameter, green with brown or ochre border. Dorsal horns (2.2–3 mm) and lateral horns (1.5–2 mm) green at base, brown distally and white-tipped. Body tubercles variable in size, larger ones white-tipped. Paired dorsal purple spots on segments six and eight, latter developing towards end of instar. Pleural fold distinct, consisting of white tubercles. Fourth instar lasts a minimum of 23 days; length attained, 22–25 mm.

**Fifth instar.** (Figs. 7 & 12). Headshield 5–6 mm in diameter, pale green, bordered by thin yellow or brown line. Dorsal horns 3–3.5 mm; lateral horns 2.5–3 mm, coloration as in fourth instar. Body pale green, numerous white-tipped tubercles, purple spots on segments six and eight distinct, latter often bordered by white patch. In some larvae only one or no spots on segment eight. Pleural fold light yellow. Minimum duration of fifth instar 56 days (winter); length attained, 32–42 mm.

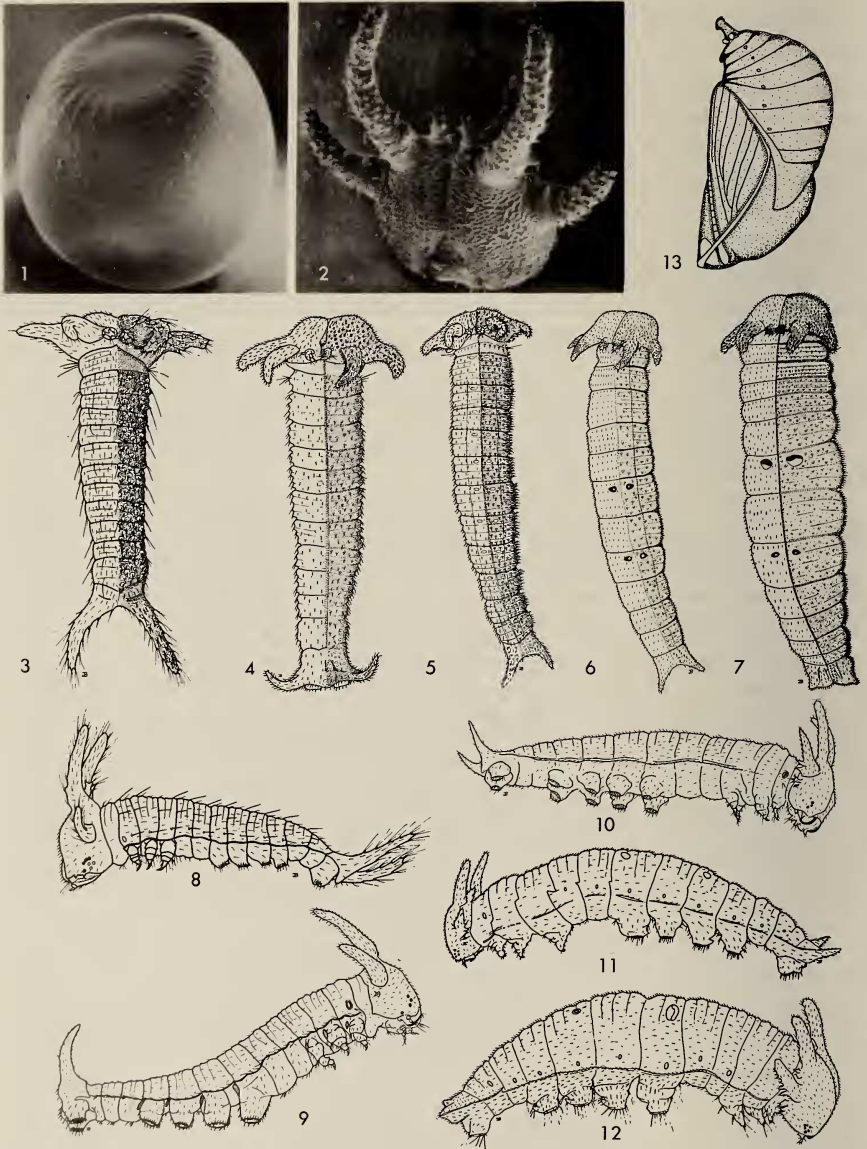
**Prepupa.** C-shaped, pale translucent green, lasting 42–50 h.

**Pupa.** (Fig. 13). Pale green; margins of wing cases white or creamy-yellow; spiracles bordered by white. Pupal stage lasts a minimum of 15 days.

**Imagines.** (Figs. 14–17). Conform to description of Van Someren & Jackson (1957). In these trials females with russet wing margins occurred more often than those with wing margins the same as the ground color. Bred male imagines have wingspan of 60–64 mm; females 66–72 mm.

### Oviposition Preferences

Careful searching of the type locality at the time the females were collected revealed that *O. arborea* var. *oconnori* and *O. natalitia* occur fairly abundantly and *O. holstii* and *O. serrulata* occur in smaller numbers. No eggs or larvae could be found on any of the plants searched. In our experiments the females of *C. marieps* did not show a preference for any specific *Ochna* species. Eggs were laid in more or less equal numbers on all the species of foodplant offered.



FIGS. 1-13. Egg and juvenile stages of *Charaxes marieps*. 1, scanning electron micrograph of egg,  $\times 60$ ; 2, scanning electron micrograph of first instar larval head-shield,  $\times 60$ ; 3, first larval instar, dorsal view; 4, second larval instar, dorsal view; 5, third larval instar, dorsal view; 6, fourth larval instar, dorsal view; 7, final larval instar, dorsal view; 8, first larval instar, lateral view; 9, second larval instar, lateral view; 10, third larval instar, lateral view; 11, fourth larval instar, lateral view; 12, final larval instar, lateral view; 13, pupa, lateral view.



FIGS. 14-17. Imagines of *C. marieps*. 14, ♂ upperside; 15, ♀ upperside; 16, ♂ underside; 17, ♀ underside.

### Foodplant Acceptability

All of the foodplants offered to the larvae were readily accepted. First and second larval instars were completed in about the same time irrespective of the particular foodplant used. Measurements of larvae on all *Ochna* species fell within the ranges given above.

### DISCUSSION

Most of the members of the genus *Charaxes* utilize the foliage of trees belonging to a number of families as larval foodplants (Dickson & Kroon, 1978). In the case of South African members of the "black" *Charaxes* complex, where the foodplants are known, these mainly

belong to the large family Leguminosae (Henning, 1977). *Charaxes marieps* and *C. k. karkloof*, also belonging to the "black" *Charaxes* complex, are exceptions in that they utilize members of the family *Ochnaceae*.

Although the *Ochna* family is a large one (some 30 genera and more than 300 species are known worldwide) only one genus, *Ochna*, with about 9 species, occurs in South Africa (Palmer & Pitman, 1972). Of these, *O. arborea* var. *oconnori*, *O. holstii*, *O. natalitia* and *O. serrulata* occur in the known habitats of *C. marieps*. Our findings that captive females oviposited on these, as well as on *O. arborea* from Natal, and that larvae accepted all of these species as foodplants, suggest that the foliage of various *Ochna* species is probably similar in chemical composition. Unfortunately, because no eggs or larvae were found on any of the *Ochna* species at the type locality, it is not possible to say which are utilized in the wild. Since the distribution of the various *Ochna* species covers most of the eastern half of South Africa other factors presumably are responsible for the restriction of *C. marieps* to the high montane forests of a relatively small area of the eastern Transvaal escarpment.

The egg, larva and pupa of *C. marieps* are very similar to those of *C. k. karkloof*, judging from the short description by Van Someren (1966) and from personal observations. There is little doubt that these two species are closely related, despite their geographical separation.

From the examination of our own and other collections it would appear that females of *C. marieps* with russet wing edges are more often captured in spring (Sept. to Nov.). This may explain why all the females in our bred series have this coloration (hatched Sept. to Nov.). We postulate that low humidity, low temperature (or both) may be responsible for this slight seasonal dimorphism in females.

*Charaxes* spp. caught in spring in Southern Africa are smaller than those taken in late summer (Feb. to April). We assume that this is also true for *C. marieps* and that it may explain the discrepancy in size between our bred specimens (males, 60–64 mm; females, 66–72 mm) and wild caught specimens (males, 65 mm; females, 75 mm). The smaller spring specimens result from larvae that have fed during winter, whereas late summer hatchings represent larvae which have had the benefit of the more favorable environmental conditions during summer.

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